**Solubility constant, Ks**

**i)** Write the equation for the equilibrium present in a saturated solution of the following substances

**ii) Write the expression for Ks for each of the following**

**iii)** Calculate the solubility (or concentration) of the following substances in a saturated solution, in mol L–1

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| PbCl2  *K*s(PbC12) = 1.70 × 10–5 |
| **FeS**  *K*s(FeS) = 4.90  10–18 |
| **Fe(OH)2**  *K*s = 4.10 × 10–15 |
| **Zn(OH)2**  *K*s = 3.00 × 10–17 |
| **Ag2CrO4**  *K*s(Ag2CrO4) = 3.00 × 10–12 |
| **AgCl**  *K*s (AgCl) = 1.56 × 10–10 |
| **PbCl2**  *K*s(PbCl2) = 1.60 × 10–5 |
| **Mg(OH)2**  *K*s(Mg(OH)2) = 1.25 × 10–11 |
| **CaSO4**  *K*s (CaSO4) = 2.45 × 10–5 |
| **PbF2**  *Ks* = 3.7 x 10–8 |

**Additional questions**

**1)** In an experiment, a saturated solution was made by dissolving 1.44 × 10–3 g of Ag2CrO4 in water, and making it up to a volume of 50.0 mL.

*M* (Ag2CrO4) = 332 g mol–1. Calculate the solubility of Ag2CrO4(*s*), and hence give the [Ag+] and [CrO42–] in the solution.

**2)** Solid sodium chloride is added to 5.00 L of 0.100 mol L–1 silver nitrate solution. Calculate the minimum mass of sodium chloride that would be needed to produce a saturated solution of AgCl. Assume that there is no change in volume when the sodium chloride is added. *M*(NaCl) = 58.5 g mol–1

**3) a)** Describe what is meant by the term ‘**solubility**’.

**b)** The chloride ion concentration in sea water can be determined by titrating a sample with aqueous silver nitrate (AgNO3) using potassium chromate (K2CrO4) as the indicator. As the silver nitrate is added, a precipitate of silver chloride, (AgCl) forms. When most of the AgCl has precipitated, the Ag+(*aq*) concentration becomes high enough for a red precipitate of Ag2CrO4 to form.

Show that the solubility of Ag2CrO4 in pure water at 25°C is higher than that of AgCl. *K*s(AgCl) = 1.56 × 10–10 *K*s(Ag2CrO4) = 1.30 × 10–12

**c)** If the concentration of chromate ions is 6.30 × 10–3 mol L–1 at the point when the Ag2CrO4 starts to precipitate, calculate the concentration of Ag+ ions in the solution.

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